

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing: 27 July 2000 (27.07.00)	
International application No.: PCT/US00/01060	Applicant's or agent's file reference: 3731
International filing date: 18 January 2000 (18.01.00)	Priority date: 21 January 1999 (21.01.99)
Applicant: LAMBLIN, Claudine et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International preliminary Examining Authority on:
18 January 2000 (18.01.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

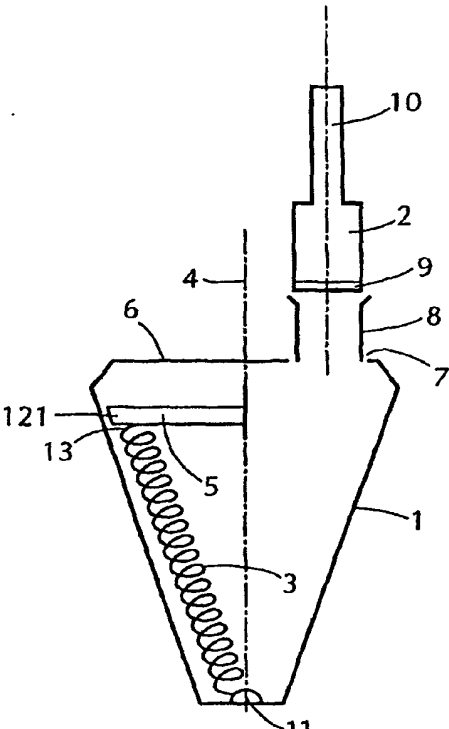
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer: J. Zahra Telephone No.: (41-22) 338.83.38
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WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification 7 : A21D 10/00</p>	<p>A1</p>	<p>(11) International Publication Number: WO 00/42858 (43) International Publication Date: 27 July 2000 (27.07.00)</p>
<p>(21) International Application Number: PCT/US00/01060 (22) International Filing Date: 18 January 2000 (18.01.00) (30) Priority Data: 99/00625 21 January 1999 (21.01.99) FR (71) Applicant (for all designated States except US): BESTFOODS [US/US]; International Plaza, 700 Sylvan Avenue, Englewood Cliffs, NJ 07632 (US). (71)(72) Applicants and Inventors: LAMBLIN, Claudine [FR/FR]; 13, rue de Thiorville, F-54000 Nancy (FR). LE FLECHER, René [FR/FR]; 39, rue Exelmans, F-78000 Versailles (FR). (74) Agent: MONTANA, Mark, A.; Norris, McLaughlin & Marcus, P.O. Box 1018, Somerville, NJ 08876 (US).</p>	<p>(81) Designated States: CA, CZ, HU, IL, MA, PL, RO, SI, SK, US, ZA, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published With international search report.</p>	
<p>(54) Title: METHOD OF PREPARING A POWDER MIXTURE</p> <p>(57) Abstract</p> <p>The cake mixture is prepared by pouring a liquid. The powder mixture comprises a base powder and a fat with a low melting point. This fat is introduced cold, into a mixing tank (1) in which it is transformed into pieces which are mixed with the base powder, still cold. The method is carried out with the aid of an extruder (2) provided with an extrusion grid (9), the apertures of which are determined in order to reduce the heating of the fat through the grid (9).</p> 		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
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The applicant thus set itself the problem of preparing a mixture, for the preparation of a cake mixture, including a fat with a low melting point, but which would not make the mixture pasty and which would keep it pulverulent

It is in these conditions that the invention is proposed which is a method of preparing a powder mixture for preparing a cake mixture by pouring on a liquid, the mixture comprising a base powder and a fat with a low melting point, characterised by the fact that

- the fat is introduced into the base powder cold,
- the fat is transformed into pieces and
- the pieces of fat are mixed into the base powder cold.

Thanks to the invention, the fat is preserved in the mixture in a solid state, without being closely connected to the grains of the base powder. These grains are not coated; it is rather they which coat the individualized pieces of fat. This will anyway be the case as long as no mechanical force is applied to the mixture and even if the temperature increases slightly, up to 30°C for example. Before melting or becoming pasty, a fat becomes plastic but remains in the solid state. Butter, for example, remains still relatively hard in the range from 20 to 25°C.

For the preparation of the cake mixture, it will be necessary to add to the mixture for example eggs, by way of liquid, and to beat the mixture. It will then be sufficient to pour the mixture into a tin and to let it bake in an oven to obtain the desired cake.

METHOD OF PREPARING A POWDER MIXTURE

The invention relates first of all to a method of preparing a powder mixture for preparing a cake mixture and making a cake, for example a chocolate cake or fruit cake.

Mixtures are known which are composed of a base powder which, for example, may comprise flour, sugar, raising agent (bicarbonate[s] and transformation acid[s]) and aromatic ingredients. In order to prepare the cake mixture the baker has to add to the powder a liquid (water or eggs for example) as well as a fat, before mixing it all, putting it into a tin and into the oven.

A recipe of this kind is not, however, always practical.

Mixtures are also known which are called complete, i.e. comprising the base powder, egg powder and a fat. But in these mixtures, the fat content has a very high melting point, for instance of the order of 50°C. In fact, with a fat having a low melting point, i.e. melting on the tongue, the mixture would lose its pulverulent quality and become pasty, with the result that starch grains of the flour would be coated with paste, preventing their hydration when liquid is poured onto them, and thus would be baked in the oven without being hydrated, which would prevent them rising and would make the cake unintentionally sandy.

However, with such mixtures containing fat with a high melting point, the cakes which are obtained do not have a very satisfactory taste; they leave on the tongue, to use the expression of the person skilled in the art, a "filming" taste.

By way of example, it will be noted that a mixture has actually been prepared containing

- 31% dark chocolate with 58% cocoa,
- 2% powdered chocolate,
- 24% concentrated butter,
- 32.5888% sugar,
- 10% wheat flour,
- 0.1500% sodium bicarbonate, and 0.2500% pyrophosphate sodium acid (its transformation acid),
- 0.0112% ascorbylpalmitate (antioxidant).

In order, during the preparation and mixing, to keep the low temperature and thus to proceed cold, it is possible to incorporate carbon dioxide snow or liquid nitrogen, making the temperature inside the mixer drop to approximately 5 or 4°C, see below.

The annexed figures make it possible to understand better the implementation of the method of the invention:

- figure 1 is a simplified view of the installation for preparing the powder mixture, with its extruder and its mixer;
- figure 2 is a plan view of the extrusion grid of the extruder, on a larger scale, and
- figure 3 is a sectional view of the grid of figure 2.

The mixing installation comprises essentially a mixing tank¹ and an extruder².

In the preferred implementation of the method of the invention, the fat is extruded cold to obtain filaments which are introduced into the base powder before being broken into pieces during the mixing.

The invention relates also to an extruder for implementing the preparation method of the invention, characterised by the fact that the conformation and the density, at the surface of the exit extrusion grid, of the extrusion apertures are determined in order to reduce the heating of the fat through the grid.

It has been seen above that the base powder contains at least the following ingredients, moreover in relative proportions which can vary:

- flour,
- sugar,
- raising agent (bicarbonate[s] and its[their] transformation acid[s]),
- aromatic matter.

The transformation acid serves, during the pouring of the liquid, the necessary release of carbon dioxide. The raising agent is a bicarbonate (sodium, potassium, ...) or a mixture of bicarbonates.

As fat, it is possible to envisage both vegetable and animal fats, but preferably butter. In a general manner, fats are considered which have a melting point lower than 37°C, advantageously lower than 32°C, or of which the melting point curve presents a low percentage of solid fraction at a temperature lower than 15°C.

The mixture also contains advantageously an antioxidant, to prevent the fat from going rancid.

Thus from a block of butter which is 0°C at its center, filaments of butter are extruded, the temperature of which does not exceed 5°C. In the case in point, the extrusion apertures 11 have a graduated cross-section, here narrowed at the top 12, towards the interior, widened towards the exterior 13, the widened detent section at the exit of the grid, being approximately 5 to 10 times as long as the narrowed section, here 9 times, for a thickness of extrusion grid of 20mm, in its narrowed portion, and of 3mm in its widened portion. As far as the density is concerned, in the internal portion of the grid, apertures, spaced out two by two, in two perpendicular directions, by one aperture diameter, correspond to a satisfactory density with regard to the cross-section of the extruded filaments and the heating of the grid. In other words, the conformation and the density, at the surface of the grid 9 of the extrusion apertures 11 are determined in order to reduce the heating of the fat through the grid.

It will be noted that the plasticity of certain fats could lead to reversing the direction of the extrusion apertures 11, with their narrowed section not at the top but at the bottom.

The extruded filaments enter by the off-centre hatch 7 of the tank. Under the action of arm 5, screw 3 and of the other ingredients being mixed, stirred and raised, the filaments are cut into small pieces. It will be noted, however, that, in order to prevent accumulation of fat filaments on the mixing arm 5 and to safeguard the homogeneity of the mixture, the extrusion process is interrupted cyclically during periods of safeguarding (the homogeneity of the mixture), when the arm 5 arrives opposite the receiving hatch 7, thanks to

The tank 1, here with an axis 4 like a truncated cone, opening out upwards, comprises an endless screw 3 for raising and mixing and a mixing arm 5. The mixing arm 5 extends, in the upper portion of the tank, substantially perpendicular to the axis 4 and here radially between this axis 4 and the wall of the tank 1. During preparation, the arm 5 is driven in rotation around the axis 4.

The endless screw extends substantially parallel to the wall of the tank 1, here between a cardan coupling 11 at the base of the tank and the free end 12 of the arm 5.

During preparation, the Screw 3 is driven in rotation around itself and its upper end 13 is driven in a horizontal rotary movement with the free end 12 of the arm 5. The ingredients of the mixture (base powder and pieces of fat) are thus conveyed by the screw in an upward movement during the mixing and, by the screw and the mixing arm, in a horizontal rotary movement. By this double action of upward conveying and gyration, the ingredients are mixed gently and smoothly.

In the upper portion, the mixing tank 1 comprises a cover 6 provided with a hatch 7 for receiving fat, coming from the extruder 2 through a feed hopper 8. The receiving hatch 7 is here off-center for a reason which will become apparent later.

The extruder 2 with its hydraulic pressurization unit 10, is perfectly standard apart from the exit extrusion grid 9, perforated, to a pre-determined density, by specific extrusion apertures 11 making extrusion possible in good conditions, practically without heating the fat.

CLAIMS

1. Method of preparing a powder mixture for the preparation of a cake mixture by pouring a liquid, the mixture comprising a base powder and a fat with a low melting point, wherein
 - the fat is introduced into the base powder cold
 - the fat is transformed into pieces and
 - the pieces of fat are mixed into the base powder cold.
2. The method of claim 1 wherein the fat is extruded cold in order to obtain filaments which are introduced into the base powder before being broken into pieces during the mixing.
3. The method of claim 2 wherein the extrusion of fat is interrupted cyclically during periods of safeguarding the homogeneity, of the mixture.
4. The method of claim 1 wherein the ingredients of the mixture are conveyed in an upward movement during the mixing.
5. The method of claim 1, wherein the ingredients of the mixture are carried along in a horizontal rotary movement during the mixing.
6. The method of claim 1 wherein a fat is employed with a melting point lower than 32°.
7. The method of claim 1 wherein a fat is employed, the melting point curve of which presents a low percentage of solid fraction at a temperature lower than 15°C.
8. An extruder for implementing the preparation method of claim 2, comprising an exit extrusion grid, characterised by the fact that the conformation and

which the mixture remains effectively relatively homogenous, without pieces of filament which are too long.

To resume the preparation method, in the mixing tank approximately 800 kg of base powder are prepared after 15 minutes of stirring. Then dry ice, or carbon dioxide snow, is added to lower the temperature of the mixture, then the stirring is carried out for a further 4 minutes approximately, the temperature of the mixture having dropped below 5°C.

Then the block of butter which is 0°C is extruded to obtain filaments with a temperature which is also lower than 4°C and the whole is mixed for approximately one minute. It only remains to package the preparation, for example in 480g sachets.

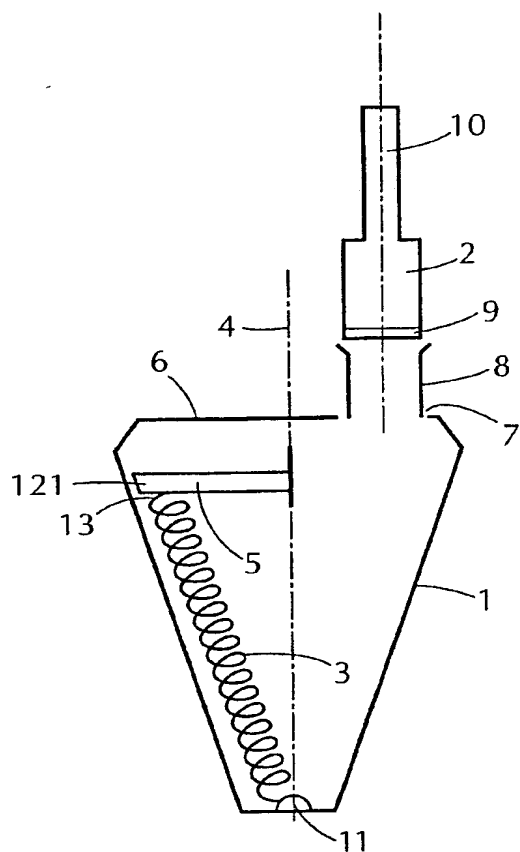



FIG. 1

the density, at the surface of the grid reduce the heating of the fat through the grid.

9. The extruder of claim 8 wherein the extrusion apertures have a graduated cross-section with a detent portion with an enlarged section at the exit of the grid.
 10. The extruder of claim 8 wherein the extrusion apertures, in the inside
-
- portion of the grid, are spaced out two by two, in two perpendicular directions, by one aperture diameter.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/01060

A. CLASSIFICATION OF SUBJECT MATTER														
IPC(7) : A21D 10/00 US CL : 425/549, 104, 559														
According to International Patent Classification (IPC) or to both national classification and IPC														
B. FIELDS SEARCHED														
Minimum documentation searched (classification system followed by classification symbols) U.S. : 425/549, 104, 559														
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched ROMBAUER, JOY OF COOKING														
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) DIALOG, SEARCH TERMS: EXTRUDER, BUTTER, CAKE, FAT, EXTRUDED FAT														
C. DOCUMENTS CONSIDERED TO BE RELEVANT														
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.												
Y	ROMBAUER. I. The Joy of Cooking. 1974. pages 539-540, 666-667, especially page 671.	1, 4-7												
Y,p	US 5,955,114 A (LLANOS) 21 September 1999, col. 1, lines 1-25.	2,3												
Y	US 4,844,937 A (WILKINSON et al) 04 July 1989, col. 4, lines 10-25.	8-10												
Y	US 5,198,245 A (DAOUSE) 30 March 1993, col. 3, lines 25-30.	8-10												
Y	ANON. Our Best Baking Guide; Sweets, Treats and Other Goodies. Family Circle. November 1995. v108, n16, pages 113-117.	1												
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.														
<table border="0"> <tr> <td>* Special categories of cited documents:</td> <td>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"E" earlier document published on or after the international filing date</td> <td>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"&" document member of the same patent family</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td></td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>			* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family	"O" document referring to an oral disclosure, use, exhibition or other means		"P" document published prior to the international filing date but later than the priority date claimed	
* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention													
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone													
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art													
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"O" document referring to an oral disclosure, use, exhibition or other means														
"P" document published prior to the international filing date but later than the priority date claimed														
Date of the actual completion of the international search 24 FEBRUARY 2000		Date of mailing of the international search report 09 MAR 2000												
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230		Authorized officer PHILIP DUBOIS  Telephone No. (703) 308-0651												

PATENT COOPERATION TREATY

PCT

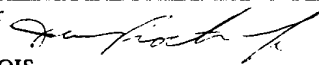
INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

29 SEP 2000	
WIPO	PCT

Applicant's or agent's file reference 3731	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US00/01060	International filing date (day/month/year) 18 JANUARY 2000	Priority date (day/month/year) 21 JANUARY 1999
International Patent Classification (IPC) or national classification and IPC IPC(7): A21D 10/00 and US Cl.: 425/549, 104, 559		
Applicant BESTFOODS		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.	
2. This REPORT consists of a total of <u>4</u> sheets. <input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT). These annexes consist of a total of <u>2</u> sheets.	
3. This report contains indications relating to the following items: I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of report with regard to novelty, inventive step or industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application	

Date of submission of the demand 16 MARCH 2000	Date of completion of this report 25 AUGUST 2000
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer  PHILIP DUBOIS
Facsimile No. (703) 305-3230	Telephone No. (703) 308-0651

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/01060

I. Basis of the report**1. With regard to the elements of the international application:***☐ the international application as originally filed☒ the description:

pages (See Attached) _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☒ the claims:

pages (See Attached) _____, as originally filed
pages _____, as amended (together with any statement) under Article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____

☒ the drawings:

pages (See Attached) _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☒ the sequence listing part of the description:

pages (See Attached) _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).☐ the language of publication of the international application (under Rule 48.3(b)).☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:**☐ contained in the international application in printed form.☐ filed together with the international application in computer readable form.☐ furnished subsequently to this Authority in written form.☐ furnished subsequently to this Authority in computer readable form.☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.**4. ☒ The amendments have resulted in the cancellation of:**☒ the description, pages NONE☒ the claims. Nos. 10☒ the drawings, sheets/fig NONE**5. ☒ This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).****

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

**Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/01060

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. statement

Novelty (N)

Claims	<u>1-9</u>	YES
Claims	<u>NONE</u>	NO

Inventive Step (IS)

Claims	<u>1-9</u>	YES
Claims	<u>NONE</u>	NO

Industrial Applicability (IA)

Claims	<u>1-9</u>	YES
Claims	<u>NONE</u>	NO

2. citations and explanations (Rule 70.7)

Claims 1-9 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest a method of preparing a liquid, the mixture comprising a base powder and a fat with a low melting point wherein: 1) the fat is extruded cold in order to obtain filaments which are introduced into the base powder cold before being broken in pieces; 2) the fat is transformed into pieces during mixing; 3) the pieces of fat are mixed into the base powder cold.

----- NEW CITATIONS -----

NONE

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

I. BASIS OF REPORT:

This report has been drawn on the basis of the description,
page(s) 1-7, as originally filed.
page(s) NONE, filed with the demand.
and additional amendments:
NONE

This report has been drawn on the basis of the claims,
page(s) NONE, as originally filed.
page(s) NONE, as amended under Article 19.
page(s) NONE, filed with the demand.
and additional amendments:
Pages 8 and 9, filed with the letter of 24 August 2000

This report has been drawn on the basis of the drawings,
page(s) 1-2, as originally filed.
page(s) NONE, filed with the demand.
and additional amendments:
NONE

This report has been drawn on the basis of the sequence listing part of the description:
page(s) NONE, as originally filed.
pages(s) NONE, filed with the demand.
and additional amendments:
NONE

5. (Some) amendments are considered to go beyond the disclosure as filed:
NONE

CLAIMS

1. Method of preparing a powder mixture for the preparation of a cake mixture by pouring a liquid, the mixture comprising a base powder and a fat with a low melting point, wherein
 - the fat is extruded cold in order to obtain filaments which are introduced into the base powder cold before being broken into pieces
 - the fat is transformed into pieces during mixing and
 - the pieces of fat are mixed into the base powder cold.
2. The method of claim 1 wherein the extrusion of fat is interrupted cyclically during periods of safeguarding the homogeneity, of the mixture.
3. The method of claim 1 wherein the ingredients of the mixture are conveyed in an upward movement during the mixing.
4. The method of claim 1, wherein the ingredients of the mixture are carried along in a horizontal rotary movement during the mixing.
5. The method of claim 1 wherein a fat is employed with a melting point lower than 32°C.
6. The method of claim 1 wherein a fat is employed, the melting point curve of which presents a low percentage of solid fraction at a temperature lower than 15°C.

7. An extruder for implementing the preparation method of claim 1, comprising an exit extrusion grid, characterised by the fact that the conformation and the density, at the surface of the grid reduce the heating of the fat through the grid.
8. The extruder of claim 7 wherein the extrusion apertures have a graduated cross-section with a detent portion with an enlarged section at the exit of the grid.
9. The extruder of claim 7 wherein the extrusion apertures, in the inside portion of the grid, are spaced out two by two, in two perpendicular directions, by one aperture diameter.

